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REITZ AND JENS INC ST LOUIS MO
NATIONAL DAM SAFETY PROGRAM. HUNTER DAM (MO 10029), MISSISSIPPI--ETC(U)
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HUNTER DAM

ST. LOUIS COUNTY, MISSOURI

MO 10029

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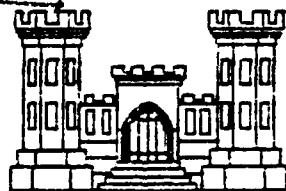
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PHASE 1 INSPECTION REPORT NATIONAL DAM SAFETY PROGRAM

Hunter Dam (MO 10029),
Mississippi - Kaskaskia - St. Louis Basin,
St. Louis County, Missouri. Phase I
Inspection Report.



PREPARED BY: U. S. ARMY ENGINEER DISTRICT, ST. LOUIS

FOR: STATE OF MISSOURI

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. <i>AD-A105146</i>	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Phase I Dam Inspection Report National Dam Safety Program Hunter Dam (MO 10029) St. Louis County, Missouri		5. TYPE OF REPORT & PERIOD COVERED Final Report
7. AUTHOR(s) Reitz & Jens, Inc.		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Army Engineer District, St. Louis Dam Inventory and Inspection Section, LMSED-PD 210 Tucker Blvd., North, St. Louis, Mo. 63101		8. CONTRACT OR GRANT NUMBER(s) DACW43-78-C-0162 ✓
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Engineer District, St. Louis Dam Inventory and Inspection Section, LMSED-PD 210 Tucker Blvd., North, St. Louis, Mo. 63101		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		12. REPORT DATE April 1978
		13. NUMBER OF PAGES Approximately 60
		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for release; distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Dam Safety, Lake, Dam Inspection, Private Dams		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report was prepared under the National Program of Inspection of Non-Federal Dams. This report assesses the general condition of the dam with respect to safety, based on available data and on visual inspection, to determine if the dam poses hazards to human life or property.		

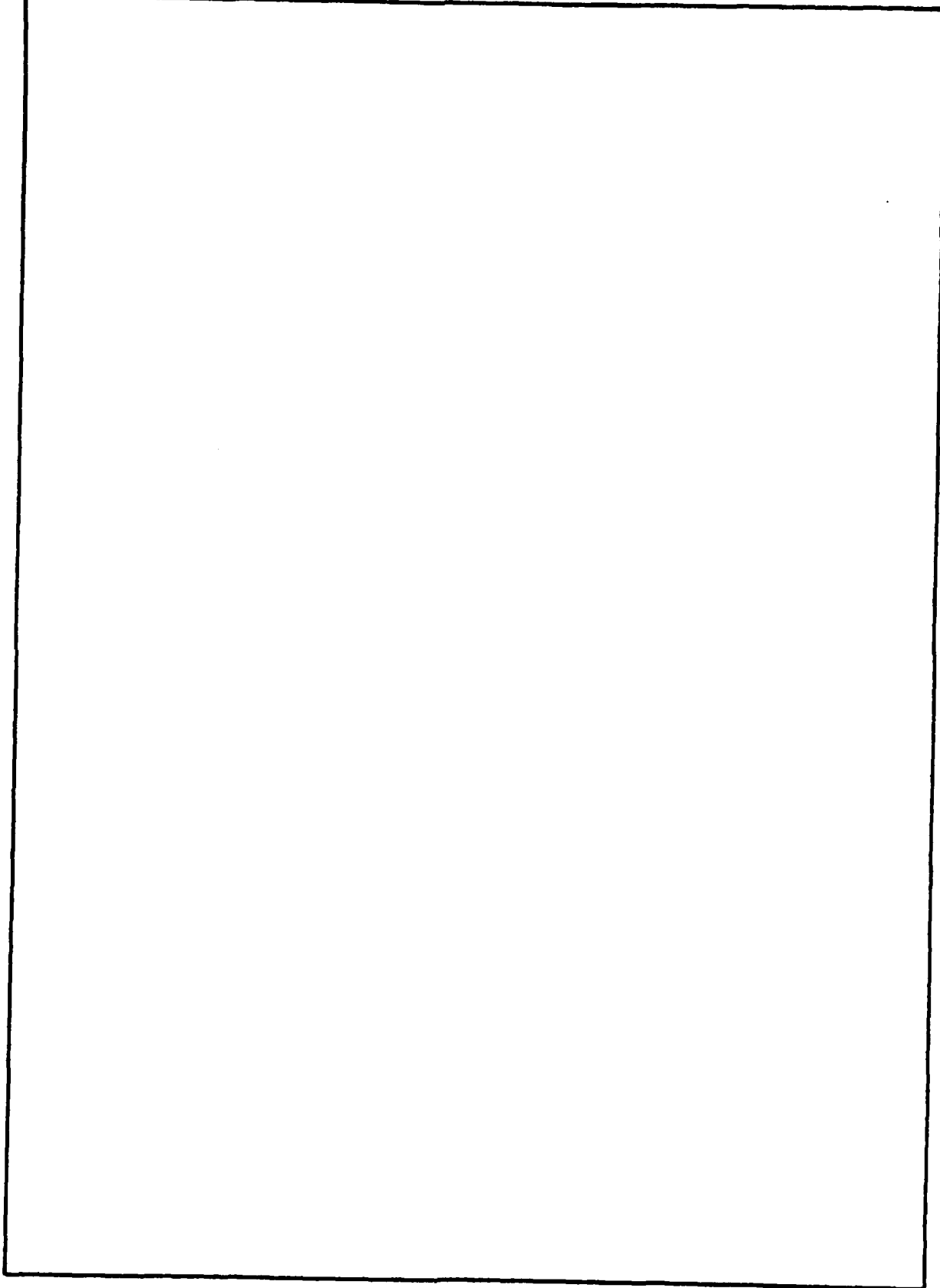
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HUNTER LAKE DAM
ST. LOUIS COUNTY, MISSOURI
MISSOURI INVENTORY NO. 10029

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

PREPARED BY: HENRY M. REITZ
FOR: ST. LOUIS DISTRICT CORPS OF ENGINEERS

APRIL 1978

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ST. LOUIS DISTRICT CORPS OF ENGINEERS
APR 1978
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DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
210 NORTH 12TH STREET
ST. LOUIS, MISSOURI 63101

IN REPLY REFER TO

SUBJECT: Hunter Dam Phase I Inspection Report

This report presents the results of field inspection and evaluation of the Hunter Dam. It was prepared under the National Program of Inspection of Non-Federal Dams.

SUBMITTED BY:

Chief, Engineering Division

27 JUL 1978

Date

APPROVED BY:

Colonel, CE, District Engineer

28 JUL 1978

Date

HUNTER DAM

ST. LOUIS COUNTY, MISSOURI

Mo 10029

The hazard classification for this dam is as follows: The Hunter Dam has a high hazard potential, meaning that the dam is located where failure may cause loss of life, serious damage to homes, extensive agricultural, industrial and commercial facilities, important public utilities, main highways or railroads. For the Hunter Dam the flood damage zone extends downstream for three to four miles. Within the first 1/4 mile downstream are twenty to twenty-five apartments, all occupied, (on Hy. 141). Within the first 1/2 mile downstream are nine homes located in the floodplain. Two electrical power lines, Highway 340 and a highway bridge are located within a mile and a quarter downstream.

PHASE I REPORT

National Dam Safety Program

NAME: Hunter Dam

STATE LOCATED: Missouri

COUNTY: St. Louis

STREAM: Creve Coeur Creek, a Tributary of the Missouri River

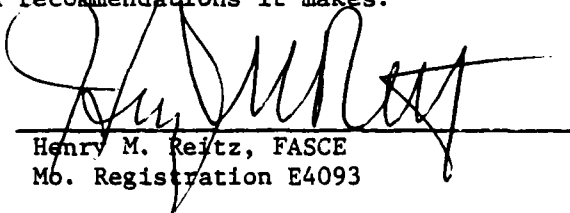
DATE OF INSPECTION: Wednesday, April 12, 1978

Hunter Dam, from records, was built in 1957 with advice from the Soil Conservation Service; two sheets of plans were furnished by SCS.

The dam has a bleeder spillway and two emergency overflow spillways one around each end of the dam.

There are no signs of instability on the downstream face of the dam embankment. At each side of the valley, just beyond the downstream slope of the dam, are cattails and similar hydrophilic plant growth and visible signs of accumulation of water traveling apparently along the contact between the base of dam and the original ground surface as underseepage.

I certify that I have directed the investigations for this report and I concur with the evaluation and recommendations it makes.



Henry M. Reitz, FASCE
Mo. Registration E4093

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
HUNTER LAKE DAM - ID NO. 10029

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SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority The National Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of safety inspection of dams throughout the United States. Pursuant to the above, the St. Louis District, Corps of Engineers, District Engineer directed that a safety inspection of the Hunter Lake Dam be made.

b. Purpose of Inspection The purpose of the inspection was to have a surficial inspection of the existing developments with an evaluation of the hydrology of the watershed above the existing dam and the hydraulics at the dam and spillway. A search for and examination of specific records of the dam and its appurtenances and field measurements applicable to the above-stated purpose are implied in and required by the charge.

c. Evaluation Criteria Criteria used to evaluate the dam were furnished by the Department of the Army, Office of the Chief of Engineers, in "Recommended Guidelines for Safety Inspection of Dams". These guidelines were developed with the help of several Federal agencies and many State agencies, professional engineering organizations and private engineers.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances

(1) Hunter Dam is a homogeneous earth dam with crest approximately 400 feet long and 32 feet above flowline of the outlet from the bleeder spillway. *P.L.*

(2) It has two broad, flat, grass-lined emergency spillways; a smaller, shallow "V" around the east flank of the dam has a slightly higher entrance elevation than a very flat spillway around the left flank of the dam. Each of the emergency spillways has the crown of an asphaltic concrete pavement of a roadway across the top of the dam for its crest. Both spillway alignments are in natural soil not in the embankment of the dam.

b. Location Location of the dam is in the northeast quadrant of the intersection of Woods Mill and Ladue Roads in west central St. Louis County, Missouri Highway 141 and County Highway AB, respectively. The center of the dam is approximately 1200 feet east and 2100 feet north of these roads. The axis of the reservoir is approximately north/south and extends from the dam southwardly to Ladue Road.

c. Size Classification The dam and reservoir are classified in the small category due to storage being less than 1000 acre feet and height less than 40 feet.

d. Hazard Classification The hazard classification is high, both in the consideration of the potential loss of life and the economic loss.

e. Ownership This dam is owned by the Lee Hunter interests.

f. Purpose of Dam The purpose of the reservoir created by the dam is a combination of recreation and as conservation for both fish and wildlife.

g. Design and Construction History The design of the dam was by the Soil Conservation Service. A history of construction appears to have been generally at the location and along the guidelines of plans prepared by the SCS. It appears to be a homogeneous earth section embankment, 32 feet maximum height. A core trench 3 feet deep and 15 feet wide was shown on SCS plans at the bottom of the gully.

h. Normal Operating Procedure Normal operational procedures are based upon the ability of this impoundment to handle runoff from extreme storm events safely due almost exclusively to reservoir storage above the recreation pool. The recreation pool elevation is controlled by a bleeder spillway, a 10-inch steel pipe with vertical axis in the lake and horizontal discharge at toe of dam. The intake end of the bleeder spillway has a small anti-vortex baffle with alignment parallel to the top of dam, welded to the top of the bleeder pipe. All aspects of all three spillways are permanent and non-moveable. Since the watershed area is essentially one-third square mile with a time of concentration of flows substantially less than an hour, no emergency provisions during a storm event could be effective.

1.3 PERTINENT DATA

a. Drainage Area - 220 acres.

b. Discharge at Damsite

(1) All discharge at the damsite is through uncontrolled spillways.

(2) Estimated experienced maximum flood at damsite is unknown.

(3) Estimated ungated spillways capacities at maximum pool elevation is 200 cfs.

c. Elevation (Feet Above M.S.L.)

(1) Top of dam - 504.2 \pm .

(2) Spillway crest - 500.5 \pm .

(3) Streambed at centerline of dam - 473 \pm .

(4) Maximum tailwater - for 100-year flood on the main Creve Coeur Creek is 480.5; 500-year - 482; tailwater elevations from "Flood Insurance Study - St. Louis County Unincorporated Area, 1973".

d. Reservoir Length of maximum pool - 2400 feet. While both the flood control pool and recreational pool can be slightly shorter, practically their lengths should be considered essentially 2400 feet.

e. Storage (Acre-feet) - The storage beneath the recreational pool elevation 500.5, from records, is 294 acre-feet. The additional storage above the recreational pool to the flood control pool, which would have a residual freeboard of 0.8 feet, is 55 acre-feet. Assuming the design surcharge would be the same as the additional volume between the flood control pool and recreational pool, the storage for the design surcharge is 55 acre-feet. The storage above recreational pool to the top of the dam (zero freeboard) is 70 acre-feet.

f. Reservoir Surface (Acres)

(1) Top of dam - 25.

(2) Spillway crest - 19.5.

g. Dam

(1) Type - earth fill.

(2) Length - 400 feet.

(3) Height - 32 feet.

(4) Top width - varies from 20 to 25 feet.

(5) Side Slope on the downstream face has an average inclination of 1V:2 $\frac{1}{2}$ H.

(6) Zoning - records do not show, nor for Phase 1 was there test drilling into the dam to determine zoning or an impervious core.

(7) Impervious core - see above (6).

(8) Cutoff - the records do show a cutoff approximately 3 feet deep beneath the "gully bottom" and essentially one scraper width wide, under the center of the dam.

(9) Grout curtain - there is no record of a grout curtain.

h. Diversion and Regulating Tunnel - the only regulating appurtenance of the dam is a steel pipe, 10 inches in diameter, set with its axis vertical and with the upper edge cut at a rake. Its length appears to be approximately 150 feet. It has no closure; its only regulating feature is a short, partially effective anti-vortex baffle.

1. Spillways

(1) Type - two emergency spillways, each a flat gradient, grass-lined channel with its high elevation controlled by asphaltic concrete pavement of the road across the top of the dam.

(2) Length - east spillway - 220 feet; west spillway - 270 feet.

(3) Crest elevation - east spillway - 503.4; west spillway - 502.4.

Upstream channels are asphaltic concrete roadway pavements that run transverse to the centerline of the spillway. The downstream channels are grass-lined.

j. Regulating Outlets - none other than the 10-inch pipe bleeder spillway.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

The design was by the U.S. Department of Agriculture, Soil Conservation Service, as indicated by two sheets of plans dated 12-10-56 and 12-4-56.

2.2 CONSTRUCTION

An earth dam with a small pipe spillway through the earth section and two emergency spillway alignments as unlined sections in natural soils around both ends of the dam.

2.3 OPERATION

In the memory of an advisor to the owner who has been familiar and involved with ongoing programs for the lake since its initial filling, the emergency spillways may not, at any time, have carried significant flows.

Bentonite was placed on the submerged slope of the dam to enable easier maintenance of a full lake during times of no rain.

Operating records suggest no unusual problems or corrective action.

2.4 EVALUATION

a. Availability. Although more than 20 years had elapsed, the County office of the Department of Agriculture had in its file several prints of exhibits it had prepared for the Hunter Dam.

b. Adequacy. The construction visibly does not agree with the plans. The downstream slope of the dam is 1V:2.5H; the slope indicated on the plans 1V:3H. The configuration of the upper end of the pipe bleeder spillway has a vertical axis, the plans show the axis to be sloping from the inlet end of the pipe to approximately the toe of the dam.

c. Validity. These records are considered to be only of limited reliability.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General. A visual inspection of Hunter Lake Dam was made on April 12, 1978. Personnel making the inspection were Henry M. Reitz and two associates including a hydraulic and soils engineer. Specific observations are discussed below. Photographs are referenced by a capital letter D, P, S, V and SE and number.

b. Dam. The dam has a paved flexible roadway across its crest (P-1, P-2, S-8). All indications around the lake, top and slopes of dam and spillway are that maintenance has been much above average (D-1, S-8, V-4, SE-3). There are no indications of sloughing visible in the dam slopes. The downstream slope of the dam is free of any brush or larger growth. The cover in the channels as well as on the downstream slope of the dam is a thick grass mat that in growing season would be tall (D-1, S-5, 6, 8, 9).

There are no indications of settlement in the crest of dam; however, there are slight vertical irregularities as would be typical of construction of an earth dam of this height without the effort to regrade the top some months or years later to have a completely constant top elevation.

In areas at or slightly downstream from the toe of dam, both to the east and west are cattails and other hydrophilic plants (V-1, SE-1, 2, 3, 4, 5, 6, 7, 8). On the east side the area was not as extensive but extended from about a vertical height of one foot above top of discharge pipe to about 4 feet above discharge pipe. Free water, running slowly but still definitely moving, could be seen in pools between the cattails.

c. Appurtenant Structures. The only regulating appurtenance of the dam is a thick steel pipe bleeder spillway 10 inches in diameter, set with its axis vertical and the upper edge cut at a rake (P-2, S-1, 2, 3). Its length appears to be approximately 150 feet. It has no valve; its only regulating feature is a short, partially effective anti-vortex baffle. Access is by boat or raft only.

The steel appears to be in good shape. Rust on the surface is normal for this or any similar installation. The downstream end of the discharge pipe for the bleeder spillway is almost entirely submerged beneath the tailwater elevation. It is in similar condition to the upper end of the pipe.

There are two emergency spillways, each of which is a flat gradient, grass-lined channel with its high elevation controlled by asphaltic concrete pavement of the road across the top of the dam (S-5, 6, 7, 8, 9). The relatively flat length of the east spillway is 220 feet; its average bottom slope is 0.01; the crest elevation is 503.4; the channel is V-shaped with side slopes of approximately 1V:10H. The west spillway has a relatively flat length of 200 feet with an average flowline slope of 0.007; its crest elevation is 502.4; its cross-section is essentially flat, about 40 feet wide with 8:1 side slopes. The only visible erosion is at the downstream end of the west spillway where a sharp break in grade has resulted in erosion (S-10). This point, however, is still at least 250 feet from the reservoir.

d. Reservoir Area. The reservoir banks have turf running into the pool elevation on very gentle slopes (D-4, P-1, 2, 3).

e. Downstream Channel. On April 12, the downstream channel was carrying a flow estimated at 1 cfs (V-6). There was a relatively shallow erosion or plunge pool around the discharge pipe from the bleeder spillway, a distance of 80 feet, more or less, out from the toe of embankment. The flow being carried away from this downstream area was at least twice as great as the rate of flow going in the upper end of the spillway (S-1, 2). At the time of inspection, the pool was a fraction of a foot above the low control elevation on the bleeder spillway.

3.2 EVALUATION

None of the conditions observed is significant enough to indicate a need for immediate remedial action or a serious potential of failure. Visually observed water near the toe of dam indicates underseepage which should at least be prevented from starting piping. Active erosion at the downstream end of the west auxiliary spillway could become a nuisance but for the foreseeable future, will not endanger the dam.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

There are no controlled outlet works for this dam; therefore, no regulating procedures exist. The inflow to the pool is controlled by rainfall and runoff; evaporation, and discharge up to the capacities of the uncontrolled spillways.

4.2 MAINTENANCE OF DAM

The type and frequency of maintenance historically at this dam should be continued.

4.3 MAINTENANCE OF OPERATING FACILITIES

No operating facilities exist at this dam.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

The inspecting engineer and associates are not aware of any existing warning system for this dam.

For a tributary watershed with time of concentration of about one-half hour, no alerting or warning system could effectively be useful.

4.5 EVALUATION

If the underseepage at the toe of dam is allowed to continue without prevention of piping which is a logical consequence thereof, a serious potential of failure may develop.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data. Design data by the U.S. Department of Agriculture, Soil Conservation Service, as indicated by two sheets of plans dated 12-10-56 and 12-4-56.

b. Experience Data. The drainage area and lake surface area are developed from USGS Creve Coeur, Mo. Quadrangle. The spillway and dam layout are from surveys made during the inspection.

c. Visual Observations.

(1) The steel pipe section and steel baffle in the bleeder spillway appear to be in good shape. The downstream end of the discharge pipe for the bleeder spillway is almost entirely submerged beneath the tailwater elevation.

(2) No drawdown facilities are available to lower or evacuate the pool.

(3) The bleeder spillway exit is at the mid-point of the dam. Each of the two auxiliary spillways is at an end of the dam in natural soils. Spillway releases will not endanger the integrity of the dam.

d. Overtopping Potential. The emergency spillways appear to be used or needed relatively infrequently and progressive erosion, as observed at the north end of the west spillway, for the great distance the ends of the spillway are removed from their entry at the lake, even the most elemental maintenance would prevent problems.

First impression was that there is much concern for the ability of the dam appurtenances and reservoir to prevent overtopping during extreme precipitation occurrences; this concern was overly pessimistic due to the high amount of storage available, the relatively low length of fetch that should be anticipated, 1+ foot under extreme storm conditions; and the width of the top of the dam. Watershed presently is almost 100% pervious and undeveloped. The probable maximum flood is defined as the flood discharge that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region. The existing spillways will pass a 100-year frequency flood without overtopping. According to the recommended guidelines from the Department of the Army, Office of the Chief of Engineers, the 100-year frequency flood is only adequate for a low hazard dam of intermediate size.

The dam is on a subwatershed of Creve Coeur Creek with about one-fortieth the area of the main Creve Coeur Creek watershed above the mouth of the subwatershed. There is no development between the dam and the main channel of Creve Coeur Creek.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations. Visual observations which adversely affect the structural stability of this dam are discussed in Section 3, paragraph 3.1b.

b. Design and Construction Data. Nothing is in hand relating to the embankment design or construction. However, for a 30-foot high embankment and the type soils in the natural soil mantle at this part of St. Louis County, a stable section should reasonably result from normal earthmoving operations. The records show a cutoff approximately 3 feet deep beneath the "gully bottom" and essentially one scraper width wide, under the center of the dam. There is no record of a grout curtain.

c. Operating Records. Operating records suggest no unusual problems or corrective action. Bentonite was placed on the submerged slope of the dam to enable easier maintenance of a full lake during times of no rain.

d. Post-Construction Changes. Post-construction change of a magnitude that would modify initial construction does not appear to have occurred.

e. Seismic Stability. The dam is built with its base still in the earth mantle. While no analysis of the dynamic stability of this dam has been made, the inspecting engineer is not aware of an earth dam built by scraper method in this part of the United States for a private owner or public owner, in which there has been a failure related to seismic activity. The magnitude of seismic forces to be anticipated in design in St. Louis County has been suggested to be a Zone II, primarily for buildings in the Uniform Building Code. An earthquake of this magnitude is not expected to cause structural failure of this embankment.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety. There is reason for more concern about the safety of Hunter Dam due to overtopping during a rare or more extreme storm event than for the proportions or method of construction of the dam.

The hydrologic/hydraulic questions are in no way related to the dam or some latent conditions that may have been obvious during construction but for which there is no record or that may have been covered over in the development to date. The possibility which, with increasing time, may become a more serious probability of adverse effects or underseepage for the existing dam should be recognized.

b. Adequacy of Information. Due to the lack of engineering design and construction data, the conclusions in this report were based on performance history and external visual conditions. The inspection team considers these data sufficient to support the conclusions herein.

c. Urgency. The urgency for investigation and decision as to remedial measures to prevent loss of soil (piping) due to underseepage or through-seepage, is sufficient that these questions should be addressed by the end of 1978.

d. Necessity for Phase II. Based on the results of the Phase I inspection, no Phase II inspection is recommended.

e. Seismic Stability. This dam is located in Seismic Zone II. An earthquake of this magnitude is not expected to be hazardous to this dam.

7.2 REMEDIAL MEASURES

a. Alternatives. Height of dam should be increased to pass the probable maximum flood without overtopping the dam.

b. The potential for probable piping due to underseepage should be removed.

c. O&M Maintenance and Procedures. The following O&M maintenance and procedures are recommended:

(1) Check the downstream slope periodically for seepage and stability problems. If seepage flows are observed or sloughing noted, the dam should be inspected and situation evaluated by an engineer experienced in design and construction of dams.

(2) A detailed inspection of the dam should be made at least every 5 years by an engineer experienced in design and construction of dams. More frequent inspections may be required if slides, seeps or other items of distress are observed.

WEST SPILLWAY

40' B.W. 8:1 SIDE SLOPES AVERAGE SLOPE = 0.01*
PREVIOUS TRIALS INDICATED APPROXIMATELY 120 CFS MAX.
SPILLWAY CAPACITY.

TRIAL DISCHARGES AT CRITICAL DEPTHS

d	A	T _w	$\frac{V_c^2}{2g} = \frac{A}{2T}$	V _c	Q	$d + \frac{V_c^2}{2g}$ SPECIFIC ENERGY
0.70	33.6	51.2	0.328	4.60	154.5	1.03
0.76	36.5	52.16	0.350	4.75	173.3	1.110
0.77	37.0	52.32	0.354	4.77	179.9	1.124 ← USE
0.80	38.4	52.80	0.364	4.84	185.8	1.164

DRAWDOWN CALCULATIONS $\Delta L = \left(\frac{\Delta d - \Delta \frac{V^2}{2g}}{S_f - S} \right)$

d	Δd	A	$\frac{V^2}{2g}$	$\Delta \frac{V^2}{2g}$	SPECIFIC ENERGY	T _w	R	AR ^{2/3}	S _f **	S _f - 0.010	$\Delta d - \frac{V^2}{2g}$	ΔSL
.77	.23	37.0	.354		1.124	52.3	.701	29.4	0.109	.099		
1.00	.20	48.0	.34	-.114	1.24	56.0	.857	43.3	0.030	.040	.065	1.7'
1.20	.20	57.6	.15	-.09	1.35	59.2	.973	56.6	0.029	.019	.025	3.7'
1.40	.20	67.2	.11	-.04	1.51	62.4	1.077	71.1	0.019	.009	.014	11.4'
1.50	.20	72.0	.097	-.013	1.60	64.0	1.125	77.9	0.015	.005	.007	26.7'
1.60	.10	76.8	.085	-.012	1.685	65.6	1.171	85.3	0.013	.003	.004	43.5'
1.70	.10	81.6	.076	-.009	1.776	67.2	1.214	92.9	0.011	.001	.002	45.5'
1.75	.10	84.0	.071	-.005	1.82	68.0	1.24	96.7	0.010	.000	.0005	190'

NORMAL DEPTH 301' ABOVE CONTROL

AT 170' SPECIFIC ENERGY = 1.79

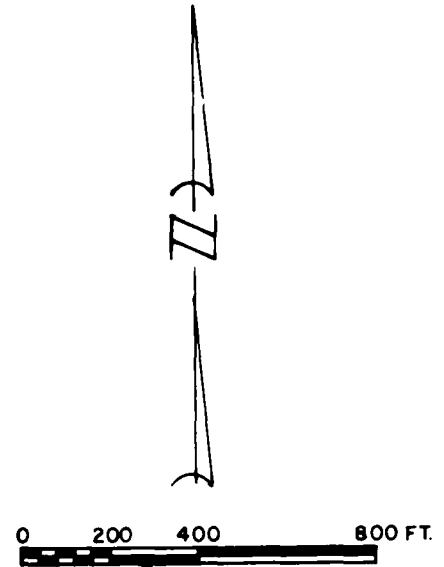
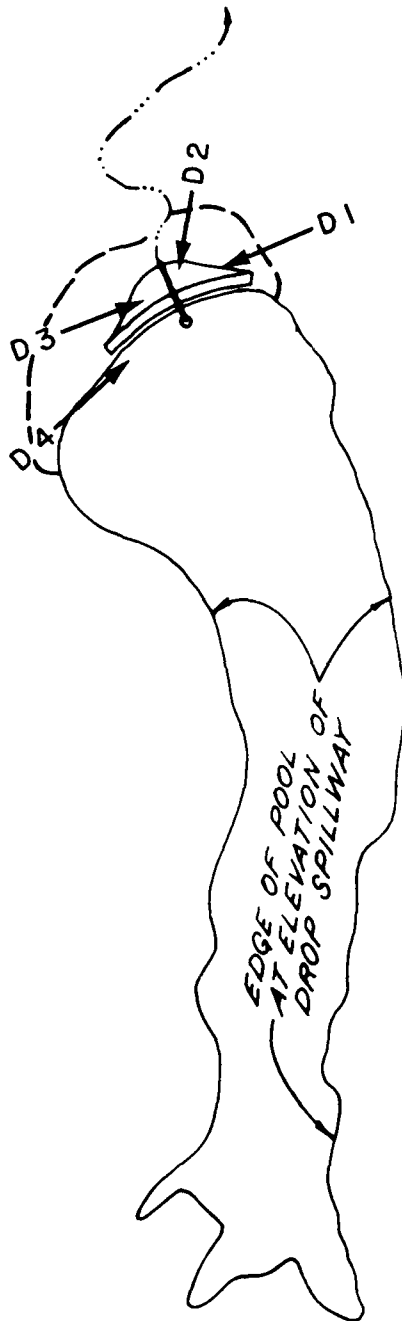
AT LOWER FLOWS NORMAL DEPTH WILL BE REACHED
BETWEEN CONTROL & UPPER END OF CHANNEL.

AT HIGHER FLOWS NORMAL DEPTH WILL NOT
OCCUR IN SPILLWAY.

* WHEN BOTTOM IRREGULARITIES ARE AVERAGED ACROSS
SECTIONS, FLOWLINE SLOPE BECOMES 0.01

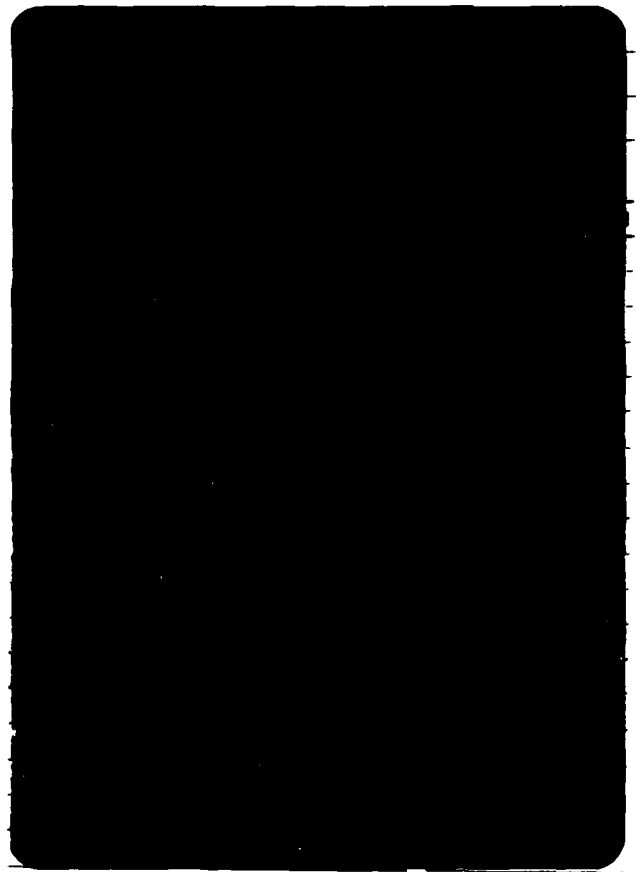
** $S_f = \left(\frac{148.6 Q}{A R^{4/3}} \right)^2$ $n = 0.08$

APPENDIX A

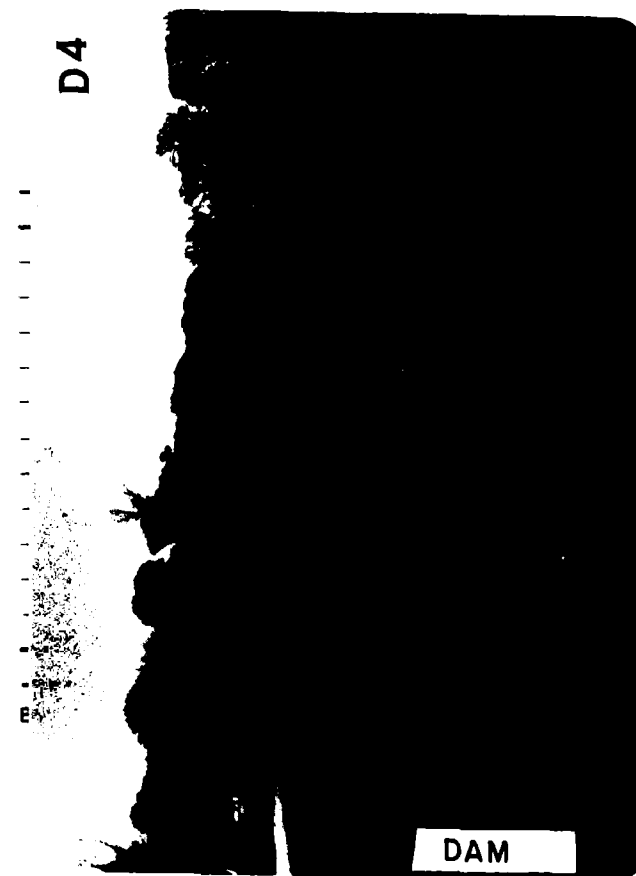


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PHOTO INDEX
FOR
DAM
HUNTER DAM
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APRIL 1978

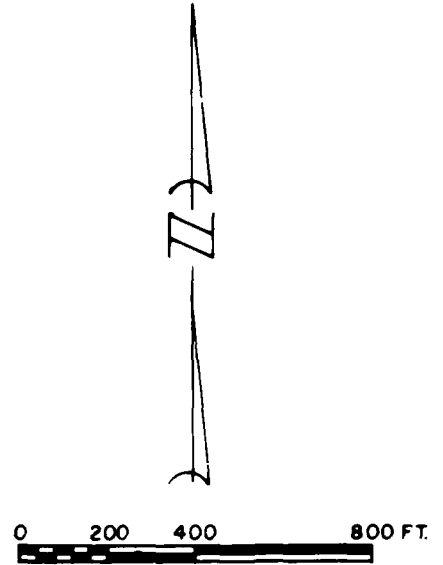
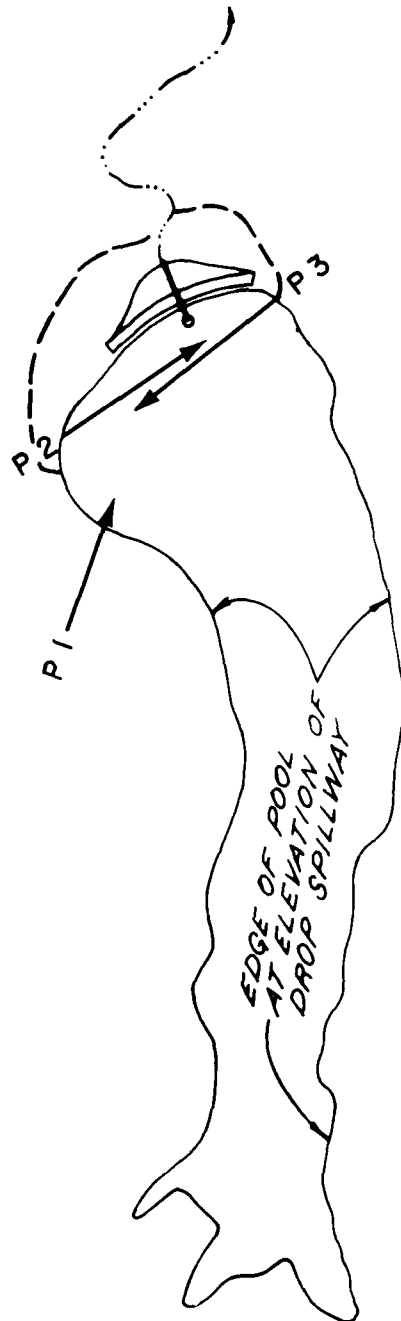


D3



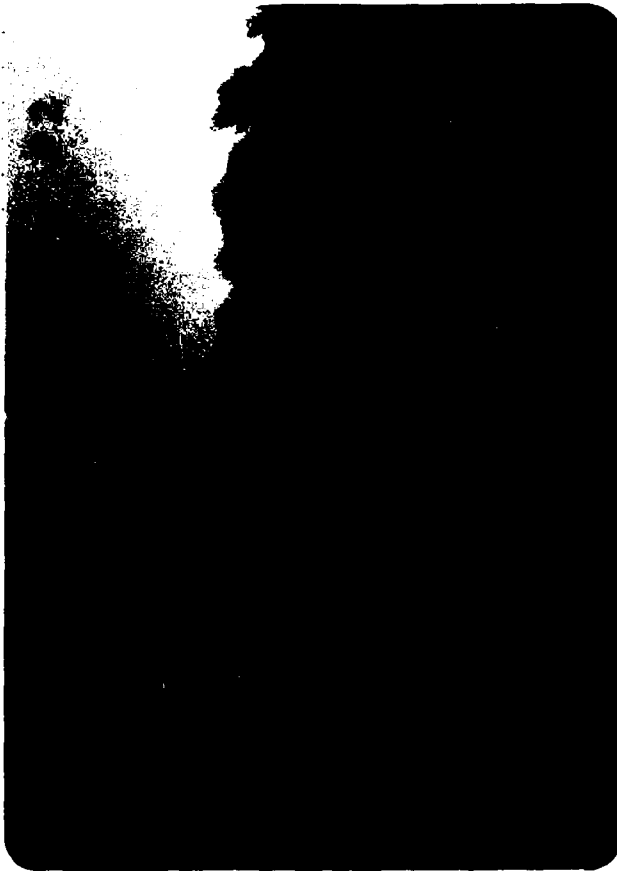
D4

DAM

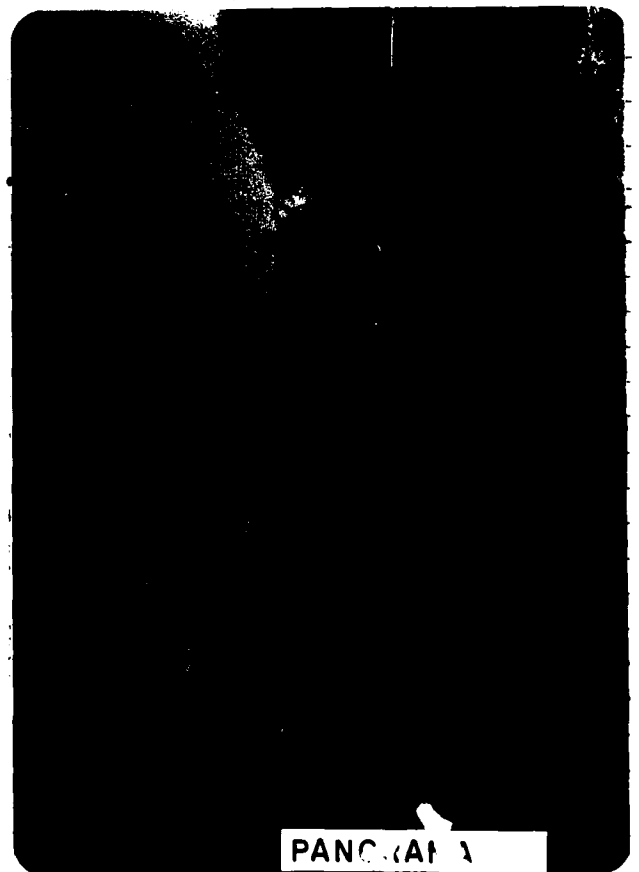


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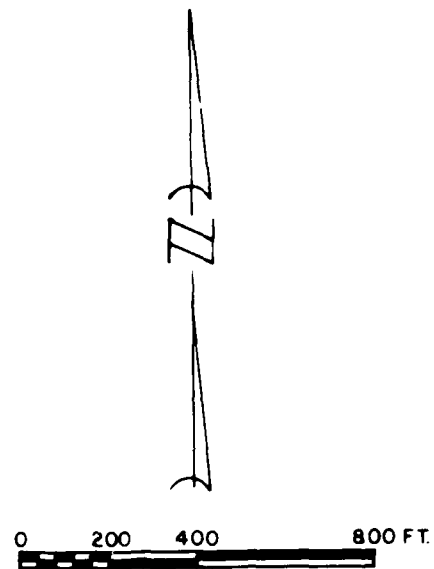
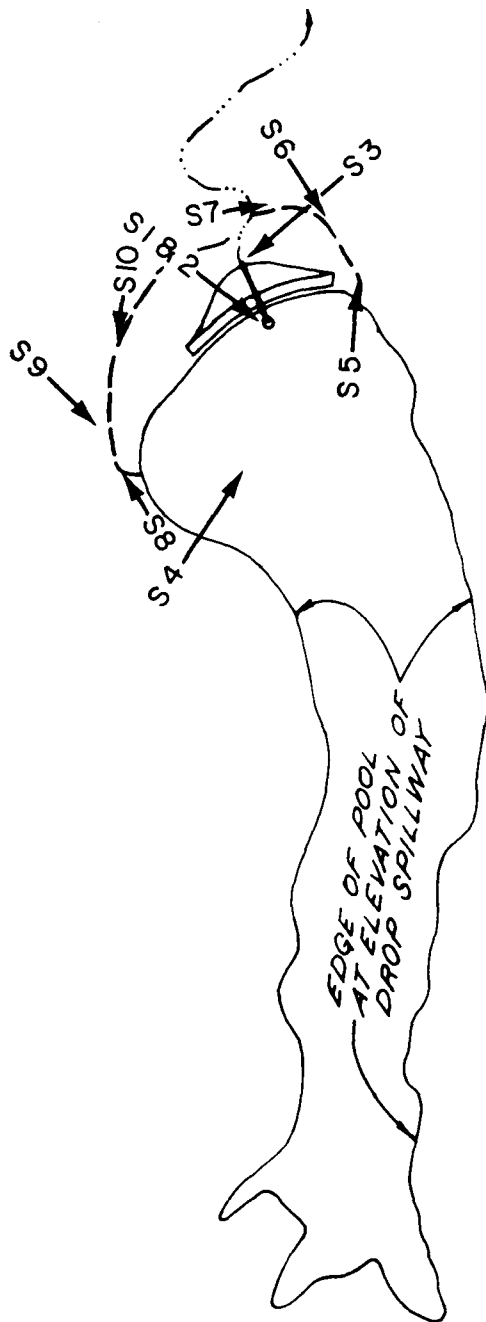
PHOTO INDEX
FOR
PANORAMA
HUNTER DAM
ST. LOUIS COUNTY, MO.
APRIL 1978



A

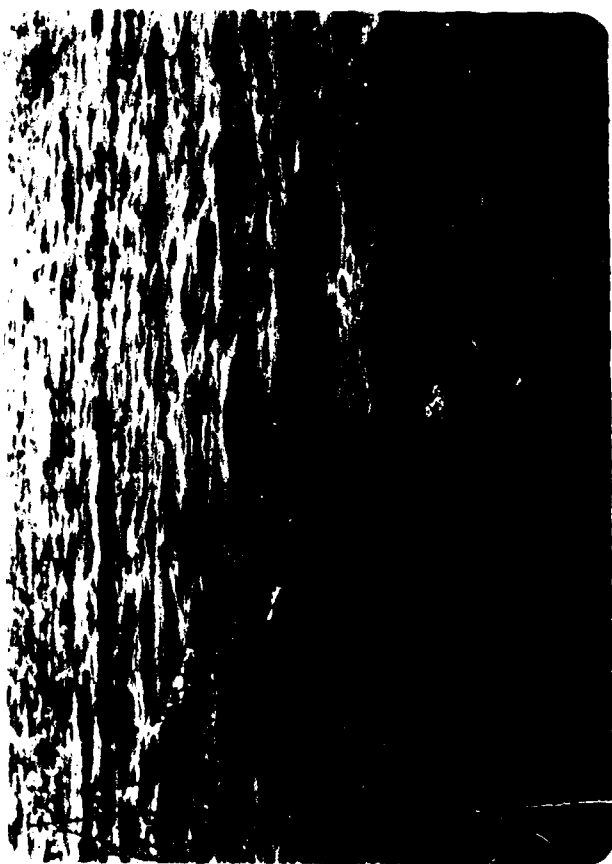
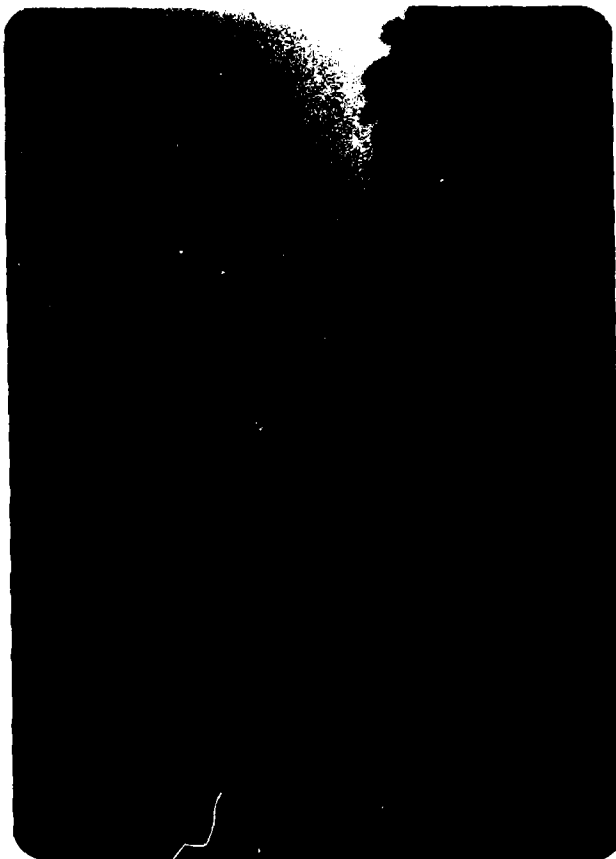


PANORAMA



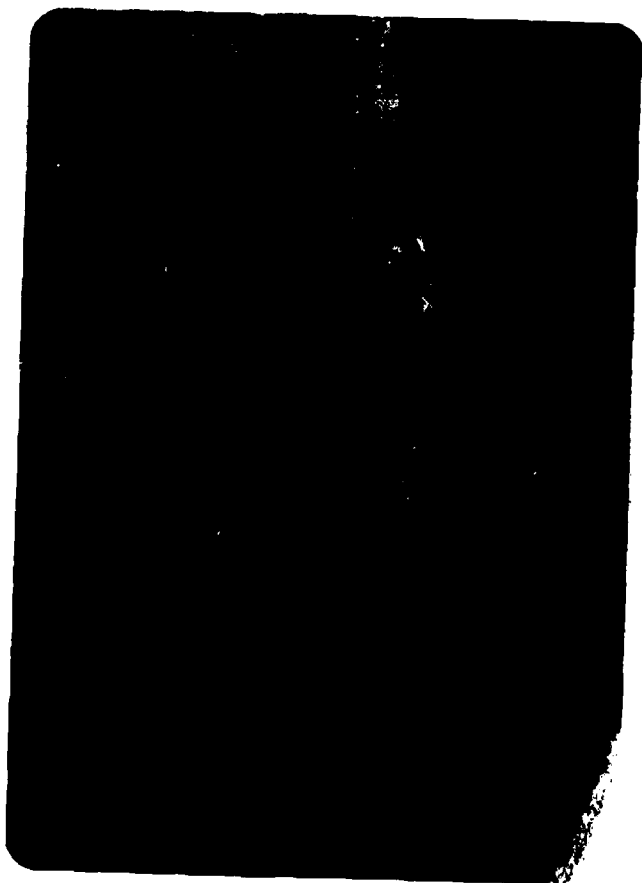
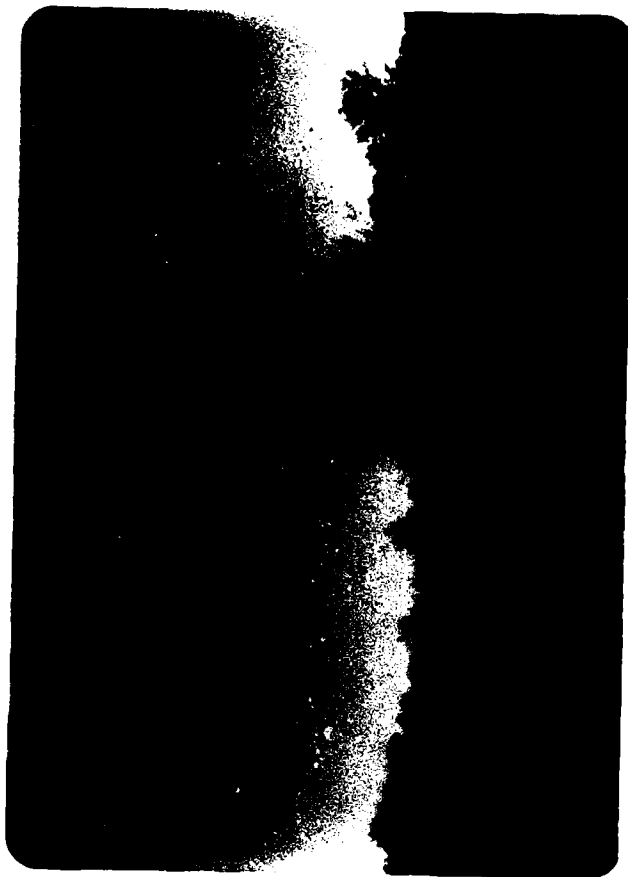
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FOR
SPILLWAYS
HUNTER DAM
ST. LOUIS COUNTY, MO.
APRIL 1978



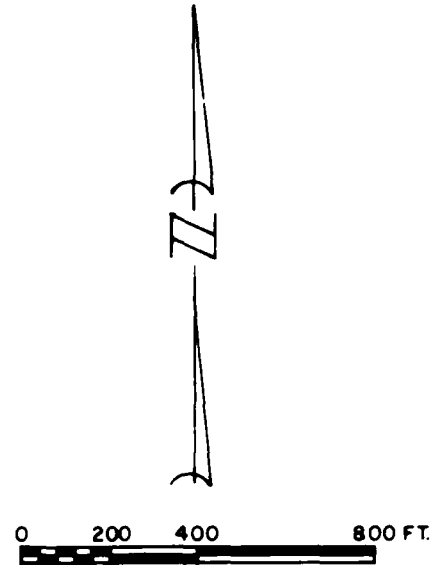
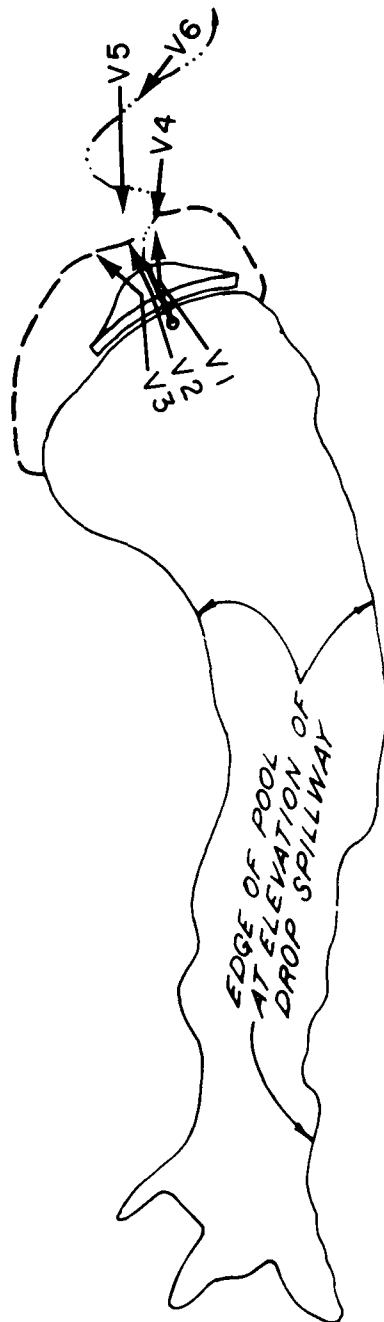
93

SPILLWAYS



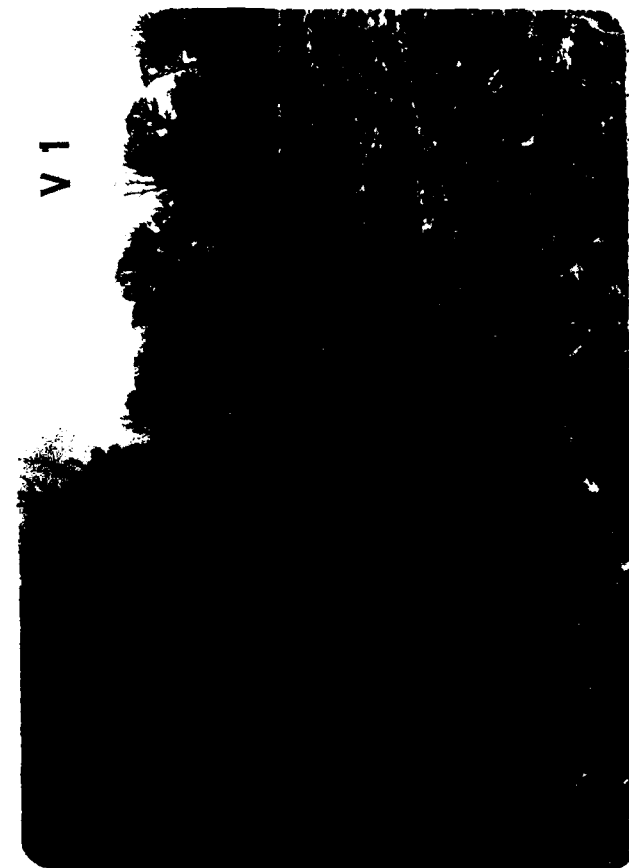


SPILLWAYS



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PHOTO INDEX
FOR
VALLEY BELOW DAM
HUNTER DAM
ST. LOUIS COUNTY, MO.
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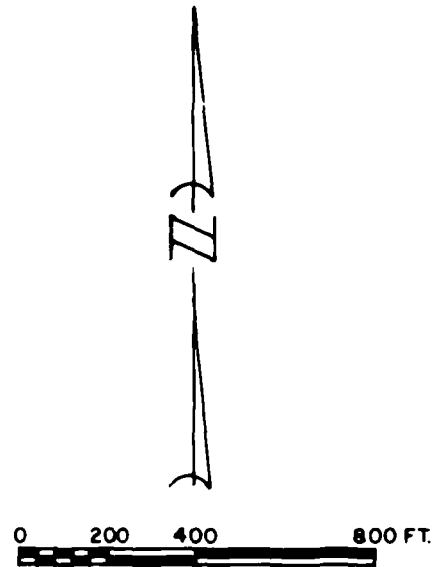
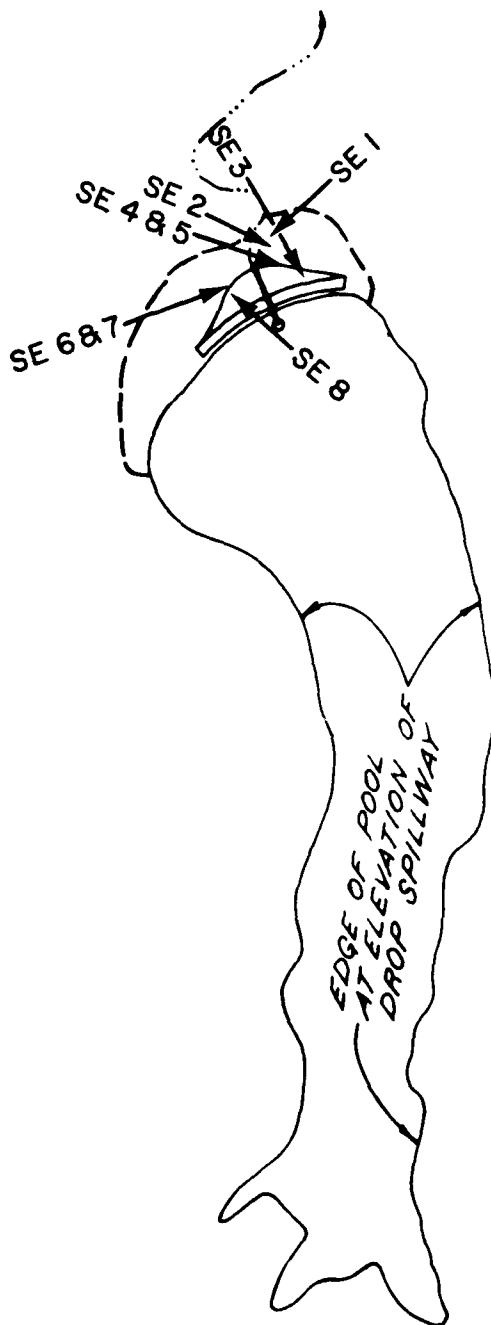


V1



VALLEY BELOW
DAM





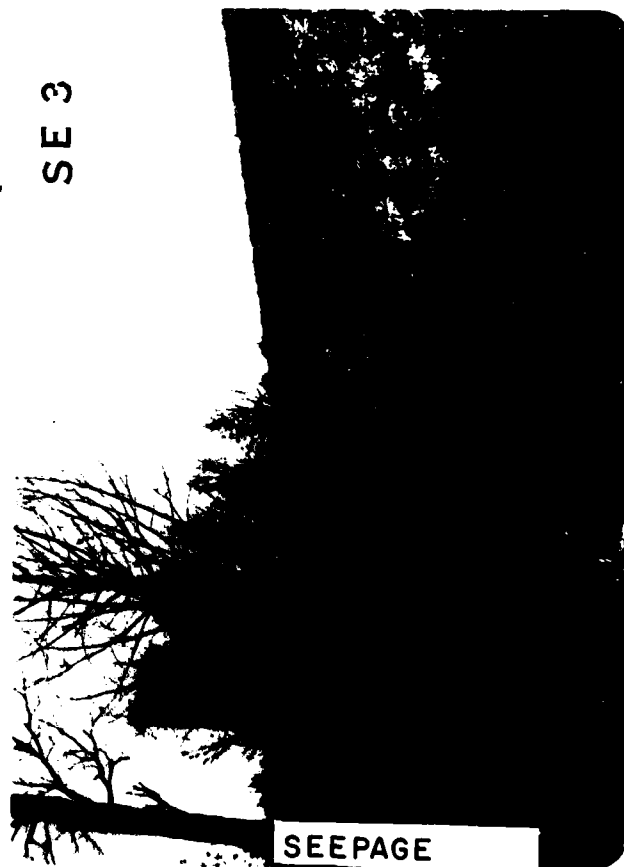
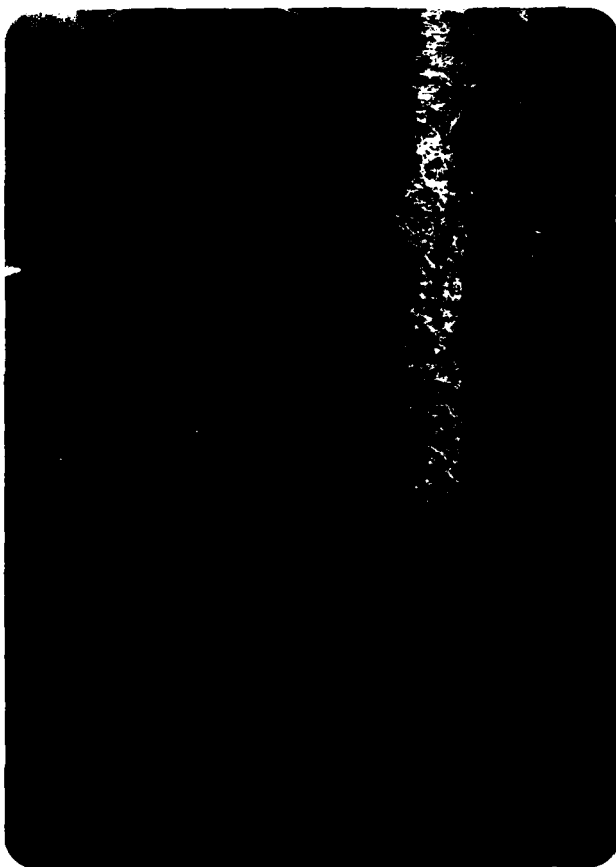
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FOR
SEEPAGE
HUNTER DAM
ST. LOUIS COUNTY, MO.
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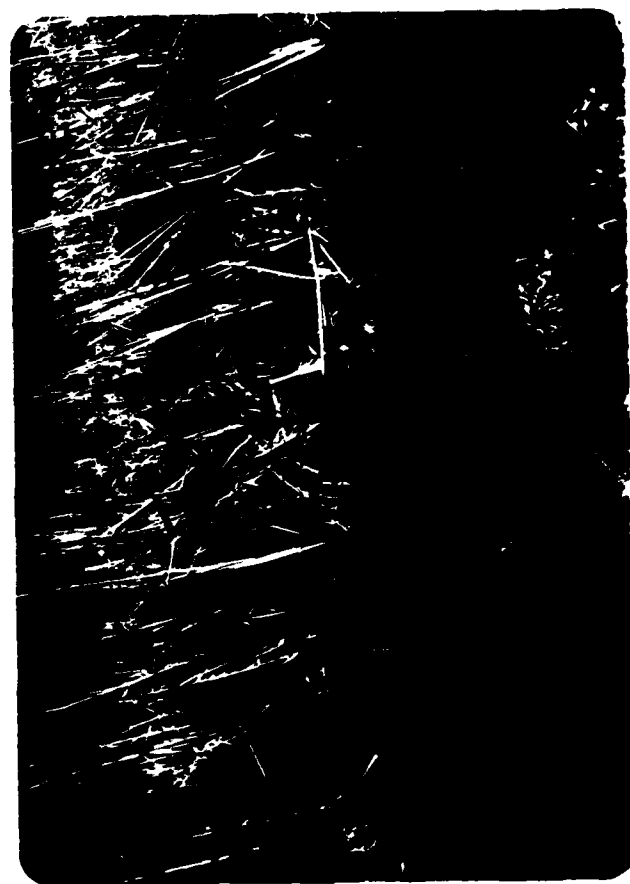
SE 2



SE 3



SEE PAGE

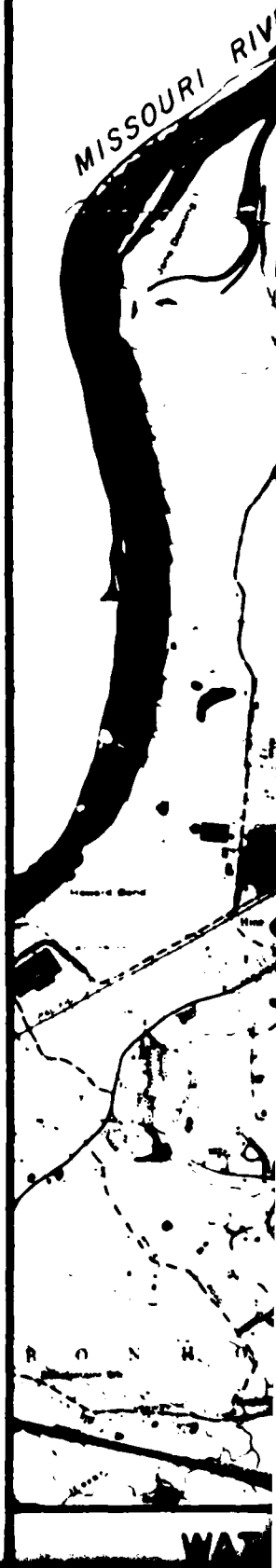


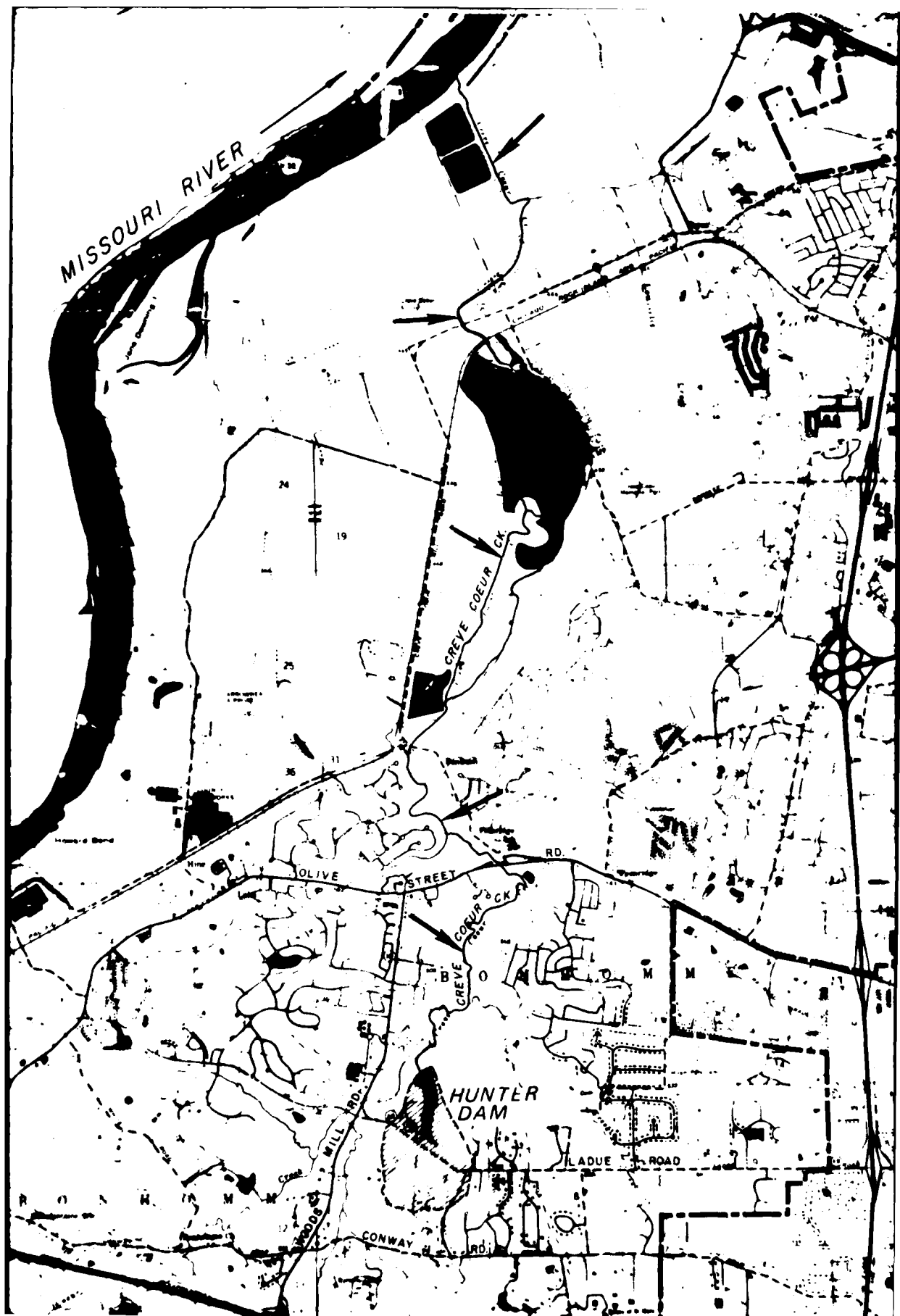
FINAL SURVEY NOTE BOOK NO.	SURVEYED	BY	DATE
	PLOTTED		
	TEMPLATE		
	AREAS		
	AREAS CHECKED		

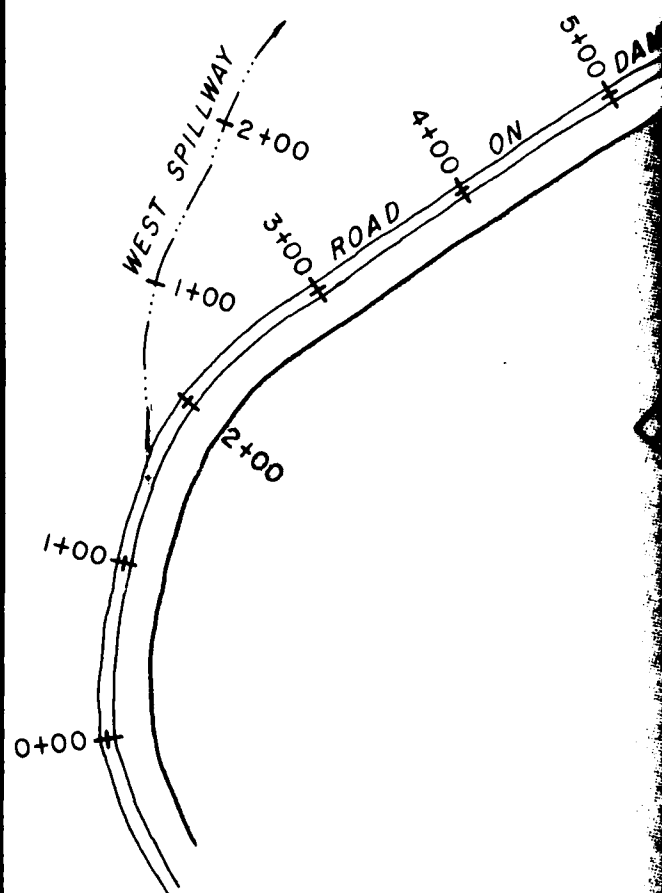


PLAN OF LAKE

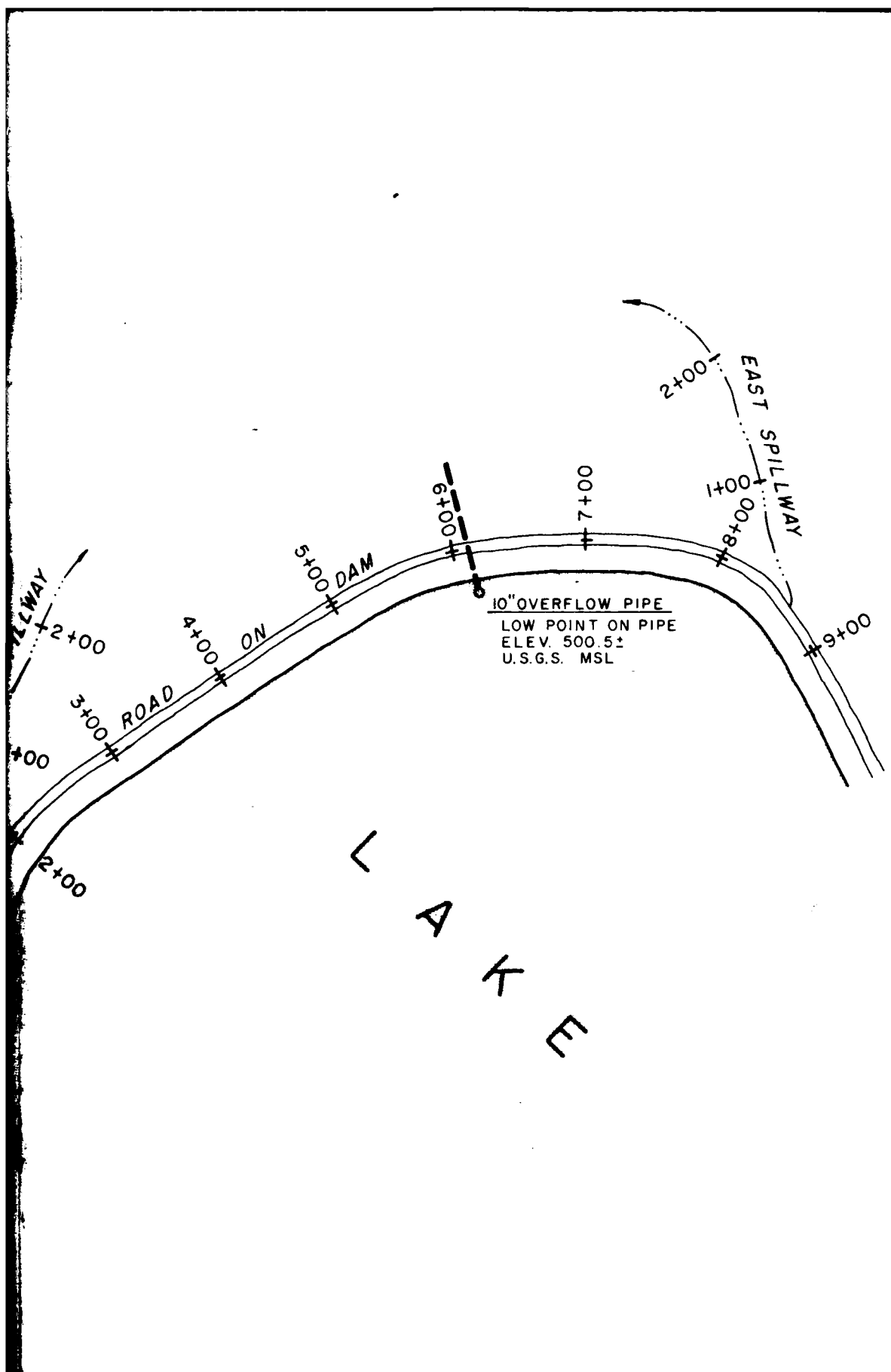
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PLAN OF DAM



PLAN OF LAKE

0 200 400 800 FT.

HYDROLOGY:

Trib. Area: 220 Ac. Lake Surface: 16 Ac. normal
5 Ac. fringe.

Runoff: 100-Yr. 10-day - 8.0 inches (Fig. 2-1A, SCS Tech. Rel. 60, June 1970)

Runoff: 100-Yr. 1-day - 4.0 inches (Fig. 2-1B, SCS Tech. Rel. 60, June 1970)

Precipitation: 100-Yr. 6-hour - 5.1 inches (Fig. 2-3, SCS Tech. Rel. 60, June 1970)

Storage above normal pool: assume 3 ft. x 16 Ac. = 48 Ac.-ft. or 576
 $576/220 = 2.61$ inches over watershed

Average spillway outflow rate to handle 100-Yr. 1-day runoff

100-Yr. 1-day runoff = 4.00 inches

storage = 2.61 inches

To be discharged 1.39 inches

$(1.39/12) \times (220 \times 43560) / 86400 = 12.8$ cfs avg.

Average spillway outflow rate to handle 100-Yr. 6-hour runoff

Assume runoff is 90% of rain = $5.1 \times .90 = 4.59$ inches

Storage 2.61 inches

To be discharged 1.98 inches

$(1.98/12) \times (220 \times 43560) / 21600 = 72.8$ cfs avg.

The existing spillways can readily handle either of these.

Runoff from a storm about one-half as large as the probable maximum probable
6-hour PMP is 27 inches (Fig. 2-4, SCS Tech. Rel. 60, June 1970)

Assume one-half of this and 95% runoff:

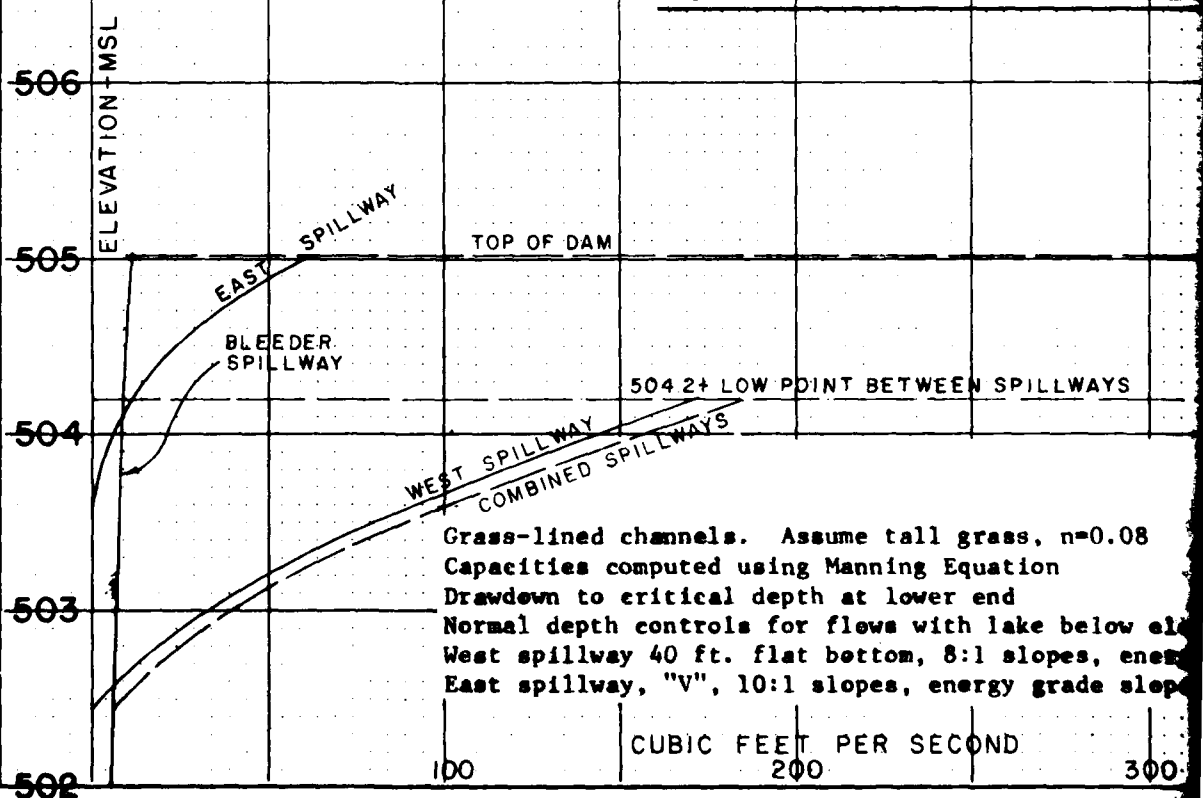
$27 \times 0.5 \times 0.95 = 12.83$ inches runoff

Assume 3 ft. of storage or 2.61 inches

Net to be discharged 10.22 inches

$(10.22/12) \times (220 \times 43560) / 21600 = 379$ cfs avg.

SPILLWAY CAPACITIES



ORIGINAL SURVEY	SURVEYED	DATE
	PLOTTED	
	TEMPLATE	
	AREAS	
NOTE BOOK	NO.	AREAS CHECKED

07
7

SCS Tech. Rel. 60, June 1976)
SCS Tech. Rel. 60, June 1976)
2-3, SCS Tech. Rel. 60, June 1976)
= 48 Ac.-ft. or 576 Ac.-In.
inches over watershed
1-day runoff

efs avg.
6-hour runoff
= 4.59 inches
2.61 inches
1.98 inches
efs avg.

or of these.
the probable maximum precipitation (PMP)
Tech. Rel. 60, June 1976)

SECTION
AT ST

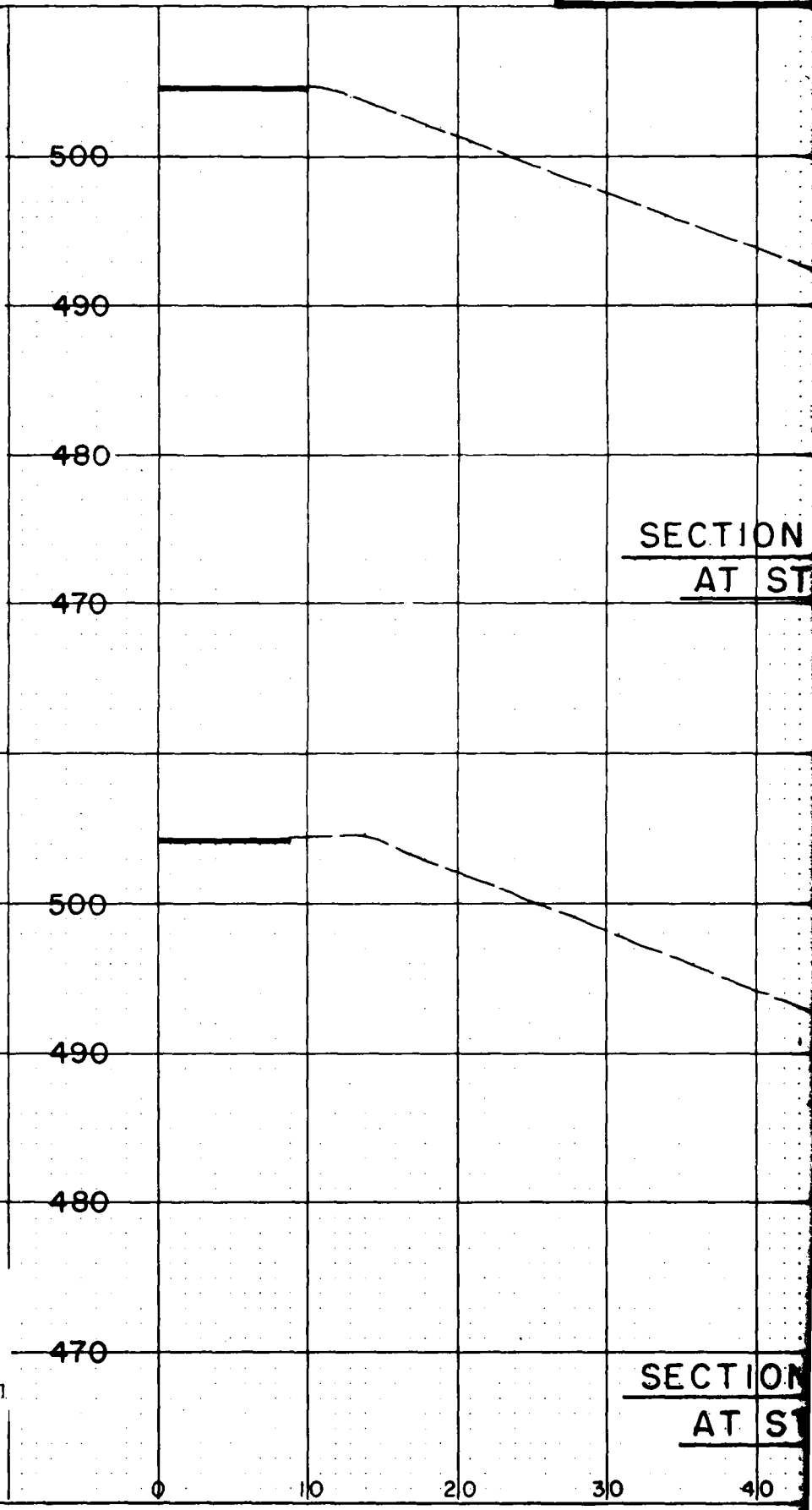
AY CAPACITIES

BETWEEN SPILLWAYS

6 tall grass, n=0.08
ining Equation
at lower end
ows with lake below elev. 504.3
ottom, 8:1 slopes, energy grade slopes at .01
es, energy grade slopes at .01

ER SECOND

300 0 10 20 30 40



WATERSHED AND OUTFLOW CHANNEL

0 4000 8000 12000

SECTION OF DAM
AT STA. 5+15

500

490

480

470

500

490

480

470

DISCHARGE PIPE
F. L. ELEV. 472.85

SECTION OF DAM
AT STA. 6+35

30

40

50

60

70

80

90

100

PLAN OF DAM

0 50 100

9.

500

490

480

470

500

490

480

470

15

0

-5

15

0

-5

0+00

1+00

2+00

3+00

PRO
TOP

LIP OF
OVERFLOW
EL. 500.5

WEST SPILLWAY

CREST OF SPILLWAY
EL. 502.4

LIP OF
OVERFLOW
EL. 500.5

0+00

1+00

2+00

3+00

PROFILE OF
WEST SPILLWAY

PHASE
INSPECTI

90

100

PLAN OF DAM AND SPILLWAYS

0 50 100 200 300 FT.

WEST SPILLWAY

EAST SPILLWAY

LOW POINT
EL. 504.2

2+00

3+00

4+00

5+00

6+00

7+00

8+00

9+00

PROFILE OF
TOP OF DAM

SCALES

1" = 5' VERT.
1" = 100' HORIZ.

+5

0

-5

2+00

3+00

OF
ILLWAY

CREST OF SPILLWAY
EL. 503.3

+5

0

-5

3+00

2+00

1+00

0+00

PROFILE OF
EAST SPILLWAY

SCALES

1" = 5' VERT.
1" = 100' HORIZ.

HUNTER DAM

ST. LOUIS COUNTY, MISSOURI

INVENTORY NO. I. D. 10029

FOR ST. LOUIS DISTRICT, CORPS OF ENGINEERS

REITZ & JENS, INC.
CONSULTING ENGINEERS

ST. LOUIS, MISSOURI
APRIL 1978

PHASE I
INSPECTION

REV. 6-28-78

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FIGURE "A"